

## References

- Aguiar, Mark and Erik Hurst. 2005. "Consumption Versus Expenditure," *Journal of Political Economy*, vol. 113, no. 5 (October), pp. 919–948, http://tinyurl.com/y9ncyfh2 (PDF, 207 KB).
- Ameriks, John, Andrew Caplin, and John Leahy. 2007. "Retirement Consumption: Insights From a Survey," *Review of Economics and Statistics*, vol. 89, no. 2 (May), pp. 265–274, http://tinyurl.com/yaxkvc9t.
- Aon Consulting. 2008. Replacement Ratio Study: A Measurement Tool for Retirement Planning, http://kgantu8 (PDF, 1.08 MB).
- Aon Hewitt. 2012. *The Real Deal: 2012 Retirement Income Adequacy at Large Companies* (Aon Thought Leadership), http://tinyurl.com/k6c873g.
- Attanasio, Orazio P. and Guglielmo Weber. 2010. "Consumption and Saving: Models of Intertemporal Allocation and Their Implications for Public Policy," *Journal of Economic Literature*, vol. 48, no.3 (September), pp. 693–751, http://tinyurl.com/y82blbxq (PDF 1.12 MB).
- Bajtelsmit, Vickie, Anna Rappaport, and LeAndra Foster. 2013. "Measures of Retirement Benefit Adequacy: Which, Why, for Whom, and How Much?" (Society of Actuaries, Pension Section and Pension Section Research Committee, January), http://tinyurl.com/yc5p3hb6.
- Banerjee, Sudipto. 2016. "Trends in Retirement Satisfaction in the United States: Fewer Having a Great Time," *EBRI Notes*, vol. 37, no. 4 (Employee Benefit Research Institute, April), pp. 1–12, http://tinyurl.com/y6vs9wx5.
- Banks, James, Richard Blundell, and Sarah Tanner. 1998. "Is There a Retirement-Savings Puzzle?" *American Economic Review*, vol. 88, no. 4 (September), pp. 769–788, http://tinyurl.com/ya37bpov.

- Barrett, Garry F. and Milica Kecmanovic. 2013. "Changes in Subjective Well-Being With Retirement: Assessing Savings Adequacy," *Applied Economics*, vol. 45, no. 35, pp. 4883–4893, http://tinyurl.com/y7s9luks.
- Bee, C. Adam and Joshua Mitchell. 2017. *Do Older Americans Have More Income Than We Think?* Working Paper No. 2017-39 (Census Bureau, Social, Economic & Housing Statistics Division, July), https://go.usa.gov/xRG87.
- Bee, C. Adam and Joshua Mitchell. 2016. *The Hidden Resources of Women Working Longer: Evidence from Linked Survey-Administrative Data*, Working Paper No. 22970 (National Bureau of Economic Research, December), www.nber.org/papers/w22970.
- Bender, Keith A. 2012. "An Analysis of Well-Being in Retirement: The Role of Pensions, Health, and 'Voluntariness' of Retirement," *Journal of Socio-Economics*, vol. 41, no. 4 (August), pp. 424–433, http://tinyurl.com/y868ocsp.
- Biggs, Andrew George. 2017. "The Life Cycle Model, Replacement Rates, and Retirement Income Adequacy," *Journal of Retirement*, vol. 4, no. 3 (Winter 2017), pp. 96–110, http://tinyurl.com/y82rb8rs.
- Biggs, Andrew G., Gaobo Pang, and Sylvester J. Schieber. 2015. *Measuring and Communicating Social Security Earnings Replacement Rates*, AEI Working Paper 2015-01 (American Enterprise Institute, January), http://tinyurl.com/y9ec6ff8.
- Binswanger, Johannes and Daniel Schunk. 2012. "What Is an Adequate Standard of Living During Retirement?" *Journal of Pension Economics and Finance*, vol. 11, no. 2 (April), pp. 203–222, http://tinyurl.com/y7tkq3bf.

- Bodie, Zvi, Jonathan Treussard, and Paul S. Willen. 2007. *The Theory of Life-Cycle Saving and Investing*, Public Policy Discussion Paper No. 07-3 (Federal Reserve Bank of Boston), http://tinyurl.com/y8fvo319.
- Bonsang, Eric and Tobias J. Klein. 2012. "Retirement and Subjective Well-Being," *Journal of Economic Behavior and Organization*, vol. 83, no. 3 (August), pp. 311–329, http://tinyurl.com/yah92rpl.
- Brady, Peter J. and others. 2017. "Using Panel Tax Data to Examine the Transition to Retirement" (paper presented at 2016 National Tax Association Annual Conference, Baltimore, Md., November 12, 2016; current draft updated on February 21, 2017), http://tinyurl.com/yahe6xwx.
- Bridges, Benjamin and Robert V. Gesumaria. 2013. "The Supplemental Poverty Measure (SPM) and the Aged: How and Why the SPM and Official Poverty Estimates Differ," *Social Security Bulletin*, vol. 73, no. 4, p. 49–69, www.ssa.gov/policy/docs/ssb/v73n4/v73n4p49.html.
- Browning, Martin and Mette Ejrnæs. 2009. "Consumption and Children," *The Review of Economics and Statistics*, vol. 91, no.1, pp. 93–111, www.mitpressjournals.org/doi/pdf/10.1162/rest.91.1.93.
- Browning, Martin and Thomas F. Crossley. 2001. "The Life-Cycle Model of Consumption and Saving," *Journal of Economic Perspectives*, vol. 15, no. 3, pp. 3–22, www.aeaweb.org/articles?id=10.1257/jep.15.3.3.
- Butrica, Barbara A. and Stipica Mudrazija. 2016. *Home Equity Patterns Among Older American Households*, Urban Institute Research Report (Urban Institute, October), http://tinyurl.com/y7m3tcnf (PDF, 527 KB).
- Butrica, Barbara A., Karen E. Smith, and Howard M. Iams. 2012. "This Is Not Your Parents' Retirement: Comparing Retirement Income Across Generations," *Social Security Bulletin*, vol. 72, no. 1, pp. 37–58, https://go.usa.gov/xRvdY (PDF, 405 KB).

- Cahill, Kevin, Michael D. Giandrea, and Joseph F. Quinn. 2006. "Retirement Patterns From Career Employment," *The Gerontologist*, vol. 46, no.4, pp. 514–523, http://tinyurl.com/y7mpxfgq.
- Census Bureau. "How the Census Bureau Measures Poverty" (accessed February 22, 2017), https://go.usa.gov/xRGnv.
- Census Bureau. "Supplemental Poverty Measure" (accessed February 22, 2017), https://go.usa.gov/xRGQx.
- Census Bureau, "2015 Supplemental Poverty Measure (SPM) Research File" (accessed February 24, 2017), https://go.usa.gov/xRsFV.
- Coe, Norma B. and Anthony Webb. 2010. *Children and Household Utility: Evidence From Kids Flying the Coop*, Working Paper 2010-16 (Center for Retirement Research at Boston College, November), http://tinyurl.com/ya73pxld.
- Congressional Budget Office. 2016. CBO's 2016 Long-Term Projections for Social Security: Additional Information (December), www.cbo.gov/ publication/52298.
- Congressional Budget Office. 2015. "The Taxation of Social Security Benefits," *CBO Blog* (February 12), www.cbo.gov/publication/49948.
- Congressional Budget Office. 2013. Rising Demand for Long-Term Services and Supports for Elderly People (June), www.cbo.gov/publication/44363.
- Congressional Budget Office. 2009. *CBO's Long-Term Model: An Overview* (June), www.cbo.gov/publication/20807.
- Copeland, Craig. 2015. "The Effect of the Current Population Survey Redesign on Retirement-Plan Participation Estimates," *EBRI Notes*, vol. 36, no. 12 (Employee Benefit Research Institute, December), http://tinyurl.com/y7b25mn9.
- Cubanski, Juliette and others. 2014. "How Much Is Enough? Out-of-Pocket Spending Among Medicare Beneficiaries: A Chartbook" (Kaiser Family Foundation, July), http://tinyurl.com/y8s5vays.

- Davidoff, Thomas. 2010. "Home Equity Commitment and Long-Term Care Insurance Demand," *Journal of Public Economics*, vol. 94, no. 1-2 (February), pp. 44–49, http://tinyurl.com/y79lg6c8.
- De Nardi, Mariacristina and others. 2016. "Medical Spending of the U.S. Elderly," *Fiscal Studies*, vol. 37, no. 3-4 (September–December), pp. 717–747, http://tinyurl.com/y9wnq42f.
- Dushi, Irena and others. 2016. "Do Households Save More When the Kids Leave Home?" Issue Brief No. 16-8 (Center for Retirement Research at Boston College, May), http://tinyurl.com/yc6nmpk3.
- Fidelity, "Getting Ready to Retire: Estimate Expenses" (accessed August 1, 2017), http://y7tgn5xv.
- Fisher, Gordon M. 1992. "The Development of the Orshansky Poverty Thresholds and Their Subsequent History as the Official U.S. Poverty Measure," Census Bureau, Poverty—Experimental Measures (May, partially revised September 1997), https://go.usa.gov/xRGne.
- Genworth Cost of Care Survey. 2016. "Compare Long Term Care Costs Across the United States" (April), http://tinyurl.com/zbltq4e.
- Gerontology Institute. 2012. *The National Economic Security Standard Index*, Paper 75 (University of Massachusetts, Boston), http://scholarworks.umb.edu/gerontologyinstitute\_pubs/75/.
- Giese, Christopher J. and Allen J. Schmitz. 2015. Premium Estimates for Policy Options to Finance Long-Term Services and Supports (prepared by Milliman Inc. for the SCAN Foundation, AARP, and LeadingAge, November), http://tinyurl.com/cuj7szt (PDF, 362 KB).
- Gould, Elise and David Cooper. 2013. Financial Security of Elderly Americans at Risk: Proposed Changes to Social Security and Medicare Could Make a Majority of Seniors 'Economically Vulnerable,' EPI Briefing Paper No. 362 (Economic Policy Institute, June), http://tinyurl.com/k98t8f7.

- Government Accountability Office. 2016. Retirement Security: Better Information on Income Replacement Rates Needed to Help Workers Plan for Retirement, GAO-16-242 (March 1), www.gao.gov/products/GAO-16-242.
- Government Accountability Office. 2015. Retirement Security: Most Households Approaching Retirement Have Low Savings, GAO-15-419 (May 12), www.gao.gov/products/GAO-15-419.
- Gwet, Philippe, Jerrod Anderson, and Steven R. Machlin. 2016. "Out-of-Pocket Health Care Expenses in the U.S. Civilian Noninstitutionalized Population by Age and Insurance Coverage, 2014," Statistical Brief No. 495 (Department of Health and Human Services, Agency for Healthcare Research and Quality, October), https://meps.ahrq.gov/data\_files/publications/st495/stat495.shtml.
- Haveman, Robert and others. 2007. "Assessing the Maintenance of Savings Sufficiency Over the First Decade of Retirement," *International Tax and Public Finance*, vol. 14, no. 4 (August), pp. 481–502, http://tinyurl.com/ycudsh29.
- Herriot, Roger A. and Emmett F. Spiers. 1975.

  "Measuring the Impact on Income Statistics of Reporting Differences between the Current Population Survey and Administrative Sources," Proceedings of the Social Statistics Section (American Statistical Association), pp. 147–158.
- Hurd, Michael D. and Susann Rohwedder. 2011. *Economic Preparation for Retirement*, Working Paper 17203 (National Bureau of Economic Research, July), www.nber.org/papers/w17203.
- Hurst, Erik. 2008. *The Retirement of a Consumption Puzzle*, Working Paper 13789 (National Bureau of Economic Research, February), www.nber.org/papers/w13789.
- Institute for Research on Poverty, University of Wisconsin-Madison. 2017. "What Are Poverty Thresholds and Poverty Guidelines?" (accessed April 17), www.irp.wisc.edu/faqs/faq1.htm.

- Institute for Women's Policy Research. 2017. "Definitions of Elder Index Expenses" (accessed May 26), www.basiceconomicsecurity.org/EI/definition. aspx.
- Johnson, Richard W., Janette Kawachi, and Eric K. Lewis. 2009. *Older Workers on the Move: Recareering in Later Life*, Research Report (Urban Institute, May), http://tinyurl.com/y838mlxh.
- Korenman, Sanders and Dahlia Remler. 2013.

  "Rethinking Elderly Poverty: Time for a Health Inclusive Poverty Measure?" Working Paper 18900 (National Bureau of Economic Research, March), www.nber.org/papers/w18900.
- LaRochelle-Cote, Sebastien, John Myles, and Garnett Picot. 2008. *Income Security and Stability During Retirement in Canada*, Analytical Studies Branch Research Paper No. 306 (Statistics Canada, March), http://tinyurl.com/y8kj7fxa.
- Li, Hongbin, Xinzheng Shi, and Binzhen Wu. 2015. "The Retirement Consumption Puzzle in China," *American Economic Review: Papers & Proceedings*, vol.105, no. 5 (May), pp. 417–441, http://tinyurl. com/y7r5dpke.
- MacDonald, Bonnie-Jeanne, Lars Osberg, and Kevin D. Moore. 2016. "How Accurately Does 70% Final Employment Earnings Replacement Measure Retirement Income (In)Adequacy? Introducing the Living Standards Replacement Rate (LSRR)," *ASTIN Bulletin: The Journal of the IAA*, vol. 46, no. 3 (September), pp.627–676, http://tinyurl.com/y97fjneo.
- MacDonald, Bonnie-Jeanne and Kevin D. Moore. 2011. "Moving Beyond the Limitations of Traditional Replacement Rates" (Society of Actuaries, September), http://tinyurl.com/y7btdezj.
- Medicare Payment Advisory Commission. 2017.

  "Chapter 1: Context for Medicare Payment Policy,"

  March 2017 Report to the Congress: Medicare Payment

  Policy (March), https://go.usa.gov/xRH3b (PDF, 3.3 MB).

- Miller, Billie Jean and Sylvester J. Schieber. 2014. "Contribution of Pension and Retirement Savings to Retirement Income Security: More than Meets the Eye," *Journal of Retirement*, vol. 1, no. 3 (Winter), pp. 14–29, http://tinyurl.com/ya9ypv4v.
- Munnell, Alicia H., Wenliang Hou, and Geoffrey T. Sanzenbacher. 2017. "The Impact of Raising Children on Retirement Security," Issue Brief No. 17-16 (Center for Retirement Research at Boston College, September), http://tinyurl.com/y7srhdns.
- Munnell, Alicia H., Wenliang Hou, and Anthony Webb. 2015. "National Retirement Risk Index (NRRI) Update Shows Half of Working-Age Americans Still Falling Short," *Journal of Retirement*, vol. 3, no. 2, pp. 34–42, http://tinyurl.com/ybokerrk.
- Munnell, Alicia H., Anthony Webb, and Wenliang Hou. 2014. "How Much Should People Save?" Issue Brief 14-11 (Center for Retirement Research at Boston College, July), http://tinyurl.com/yd475k6o.
- Munnell, Alicia H. and Anqi Chen. 2014. "Do Census Data Understate Retirement Income?" Issue in Brief No. 14-19 (Center for Retirement Research at Boston College, December), http://tinyurl.com/pchqusn.
- Munnell, Alicia H. and others. 2009. Long-Term Care Costs and the National Retirement Risk Index, Issue in Brief No. 9-7 (Center for Retirement Research at Boston College, March), http://tinyurl.com/ycyp8rbr.
- Munnell, Alicia H., Anthony Webb, and Francesca Golub-Sass. 2007. *Is There Really a Retirement Savings Crisis? An NRRI Analysis*, Issue in Brief No. 7-11 (Center for Retirement Research at Boston College, August), http://tinyurl.com/yd4bynrw.
- Munnell, Alicia H., Anthony Webb, and Luke Delorme. 2006. *A New National Retirement Risk Index*, Issue in Brief No. 48 (Center for Retirement Research at Boston College, June), http://tinyurl.com/y7pfgo7h (PDF, 217 KB).
- Munnell, Alicia H. and Mauricio Soto. 2005. What Replacement Rates Do Households Actually Experience in Retirement? Working Paper 2005-10 (Center for Retirement Research at Boston College), http://tinyurl.com/yac9qjap (PDF, 171 KB).

- Mutchler, Jan E., Yang Li, and Ping Xu. 2016. *Living Below the Line: Economic Insecurity and Older Americans Insecurity in the States 2016*, Paper 13 (Center for Social and Demographic Research on Aging), http://tinyurl.com/h9dcj5g.
- Organisation for Economic Co-operation and Development. 2017. "What Are Equivalence Scales?" (accessed February 28), http://tinyurl.com/ycosbq55 (PDF, 388 KB).
- Organisation for Economic Co-operation and Development. 2011. *Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 Countries* (OECD Publishing, March), http://tinyurl.com/bxwt3rn.
- Pang, Gaobo and Mark Warshawsky. 2014. "Retirement Savings Adequacy of U.S. Workers," *Benefits Quarterly*, vol. 30, no. 1, pp.29–38, www.ifebp.org/inforequest/ifebp/0165172.pdf (PDF, 1.45 MB).
- Purcell, Patrick J. 2012. "Income Replacement Ratios in the Health and Retirement Study," *Social Security Bulletin*, vol. 72, no. 3, pp. 37–58, https://go.usa.gov/xRGNC.
- Renwick, Trudi and Liana Fox. 2016. "The Supplemental Poverty Measure: 2015" (Census Bureau, Current Population Report, September), https://go.usa.gov/xRGQb (PDF, 709 KB).
- Rohwedder, Susann. 2006. Self-Assessed Retirement Outcomes: Determinants and Pathways, Working Paper 2006-141 (University of Michigan Retirement Research Center, November), http://tinyurl.com/yawy2ksz (PDF, 194 KB).
- Rupert, Peter and Giulio Zanella. 2015. "Revisiting Wage, Earnings, and Hours Profiles," *Journal of Monetary Economics*, vol. 72 (May), pp. 114–130, http://tinyurl.com/y88e302k.
- Scholz, John Karl and Ananth Seshadri. 2009a. "Children and Household Wealth" (draft, July), http://tinyurl.com/y7dc3ddz (PDF, 202 KB).

- Scholz, John Karl and Ananth Seshadri. 2009b. What Replacement Rates Should Households Use? Working Paper 2009-214 (Michigan Retirement Research Center), http://tinyurl.com/yd562ctc (PDF, 380 KB).
- Scholz, John Karl, Ananth Seshadri, and Surachai Khitatrakun. 2006. "Are Americans Saving 'Optimally' for Retirement?" *Journal of Political Economy*, vol. 114, no. 4 (University of Chicago Press), pp. 607–643, www.journals.uchicago.edu/doi/abs/10.1086/506335.
- Semega, Jessica L. and Edward Welniak Jr. 2015. "The Effects of the Changes to the Current Population Survey Annual Social and Economic Supplement on Estimates of Income," (draft for the 2015 Allied Social Science Association Research Conference, Boston, Mass., January), https://go.usa.gov/xRG93.
- Social Security Administration, Office of the Chief Actuary. 2016. "Replacement Rates for Hypothetical Retired Workers," Actuarial Note No. 2016.9 (June), www.ssa.gov/oact/NOTES/ran9/an2016-9.pdf (647 KB).
- Social Security Administration, Office of Retirement and Disability Policy. 2016. "Income of the Population 55 or Older, 2014," SSA Publication No. 13-11871 (April), www.ssa.gov/policy/docs/statcomps/income\_pop55/2014/incpop14.pdf (2 MB).
- Social Security Administration, Office of the Chief Actuary. 2014. "Replacement Rates for Retirees: What Makes Sense for Planning and Evaluation?" Actuarial Note No. 155 (July), www.ssa.gov/oact/NOTES/pdf\_notes/note155.pdf (41 KB).
- Social Security Administration, Office of the Chief Actuary. 2009. "Internal Real Rates of Return Under the OASDI Program for Hypothetical Workers," Actuarial Note No. 2008.5 (April), www.ssa.gov/oact/NOTES/ran5/an2008-5.pdf (56 KB).
- Steuerle, C. Eugene and Christopher Spiro. 2000. What Happens to Replacement Rates Over the Course of Retirement? Brief No. 25 (Urban Institute, June), http://tinyurl.com/y96zex5r.

- VanDerhei, Jack. 2015. "How Much Needs to Be Saved for Retirement After Factoring In Post-Retirement Risks: Evidence From the EBRI Retirement Security Projection Model," *EBRI Notes*, vol. 36, no. 3 (Employee Benefit Research Institute, March), pp. 2–16, http://tinyurl.com/y8kg8u2r.
- VanDerhei, Jack and Craig Copeland. 2010. *The EBRI Retirement Readiness Rating: Retirement Income Preparation and Future Prospects*, EBRI Issue Brief No. 344 (Employee Benefit Research Institute, July), http://tinyurl.com/y8y3m8od.
- VanDerhei, Jack. 2006. "Measuring Retirement Income Adequacy: Calculating Realistic Income Replacement Rates," EBRI Issue Brief No. 297 (Employee Benefit Research Institute, September 2006), http://tinyurl.com/ycfwt2rq.
- Vanguard. "Retirement Expenses Worksheet" (accessed February 28, 2017), http://tinyurl.com/q9y0cyr.

- Vanguard. "Retirement Income Worksheet" (accessed February 28, 2017), http://tinyurl.com/mqd2m2d.
- Warshawsky, Mark J. 2017. "Retire on the House: The Possible Use of Reverse Mortgages to Enhance Retirement Security," Mercatus Working Paper (Mercatus Center at George Mason University), http://tinyurl.com/ya65yryt (PDF, 733 KB).
- Warshawsky, Mark J. 2015. "The Retirement Crisis Controversy," *Tax Notes* (May 11), http://tinyurl.com/y9k57plo (PDF, 51 KB).
- Wu, April Yanyuan and others. 2013. How Do the Changing Labor Supply Behavior and Marriage Patterns of Women Affect Social Security Replacement Rates? Working Paper 2013-16 (Center for Retirement Research at Boston College), http://tinyurl.com/yboawwnb (PDF, 597 KB).

## About This Document

This Congressional Budget Office report was prepared at the request of the Chairman of the Senate Committee on the Budget. The report provides a framework for further analysis of the adequacy of retirement income, including income from particular sources such as Social Security benefits. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Marina Miller of CBO's Health, Retirement, and Long-Term Analysis Division wrote the report with guidance from Julie Topoleski and David Weaver. Jessica Banthin, Linda Bilheimer, Molly Dahl, Nadia Karamcheva, Noah Meyerson, and John Skeen provided useful comments on various drafts of the report. Justin Lee provided fact-checking.

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Wendy Edelberg and Jeffrey Kling reviewed the report, Loretta Lettner edited it, and Casey Labrack designed the cover and prepared the report for publication. The report and supplemental data are available on CBO's website (www.cbo.gov/publication/53191).

Keith Hall

Director

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